PAUL SCHERRER INSTITUT

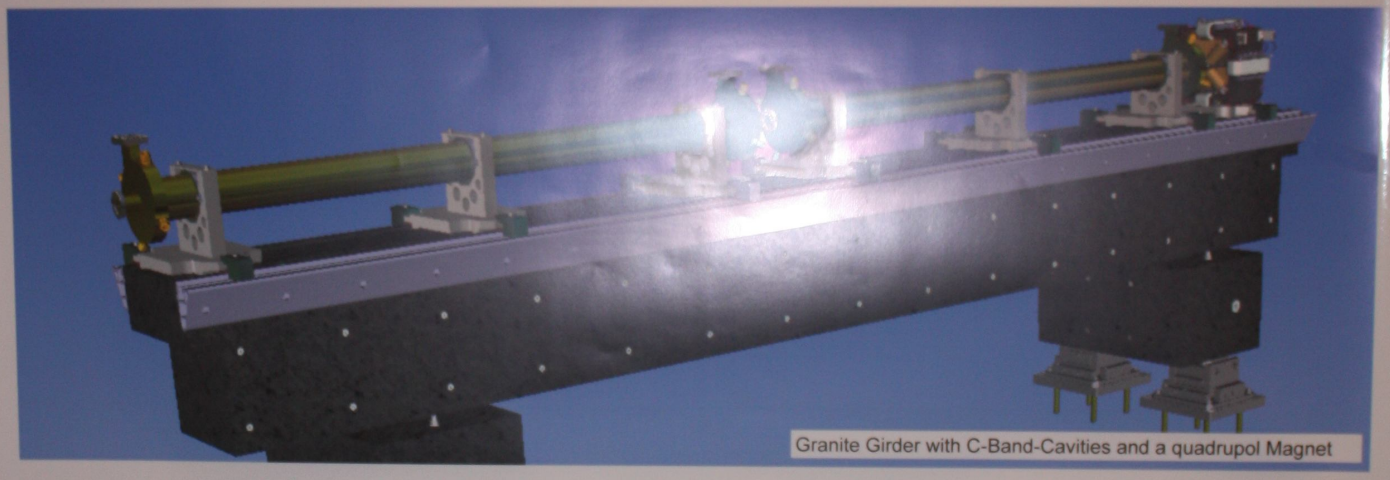
Design of Girder and Girder feet for SwissFEL

Haimo Jöhri[1]; Xinyu Wang[1] ; Johan Wickstroem[2]

[1] Paul Scherrer Institut, Division of Mechanical Engineering Sciences, 5232 Villigen PSI, Switzerland
[2] Paul Scherrer Institut, Division of Technical Support, Coordination and Operation, 5232 Villigen PSI, Switzerland

General Concept

The SwissFEL girder design is conceived as an "optical table" which allows several components to be aligned with respect to one reference. The girder itself is then positioned on manually adjustable jacks. Each jack is mounted on a steel base plate which is cemented to the floor. The modular supports for components are mounted on the girder's reference surfaces and can be individually aligned.



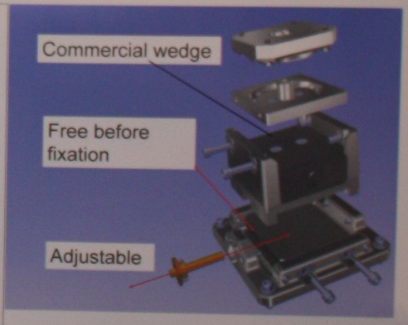
Granite Girder with C-Band-Cavities and a quadrupol Magnet

Girder

The 4-meters-long girder is made of a monolithic granite block.
The girder has high-precision reference surfaces for direct vertical and horizontal positioning of components.
On each side, an aluminium profile with integrated T-Slot is mounted to fix the fasteners.
Beyond these aluminium profiles are open-plan surfaces for the installation of electronic cables.

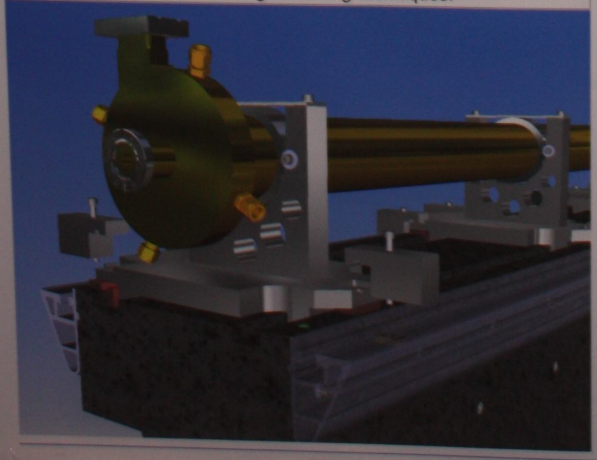
Girder feet

The relative position of the girder is controlled by using jacks. The design of the jack is consistent with the high eigenfrequencies of the girder, therefore the jack design relies on large surface contacts. Screws or spindles as structure elements, that would generate a weak point for vibrations, are avoided. The design uses commercial leveling wedges with for vertical adjustment and screws for horizontal adjustment.



Local Support System

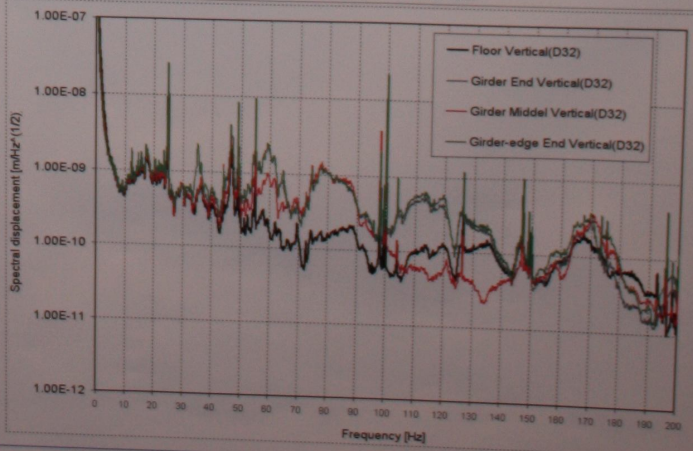
For the alignment of components, single adjustable supports are used. These supports can be placed directly on the horizontal and vertical reference surfaces of the girder. Fine adjustment of each support will be performed using shimming techniques.



Vibration Measurements

The measurements on the first prototype result in :

RMS displacement of Floor vertical	:12.2 nm
RMS displacement of Girder Middle vertical	:15.1 nm
RMS displacement of Girder End	:19.2 nm



Contacts: haimo.joehri@psi.ch